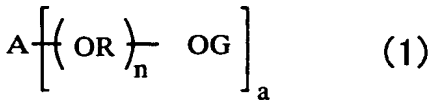
CLAIMS

1. A sealant for liquid crystals characterized by comprising an epoxy resin (a) represented by general formula (1):



(1)

(wherein a represents an integer of 2 to 4; n represents 0 to 3 (average value); R represents a divalent hydrocarbon group of 2 to 6 carbon atoms; A represents a polyvalent aromatic group; and G represents a glycidyl group, provided that when n is 0, (a) an epoxy resin represented by general formula (1) is a bisphenol S-type.), (b) a thermo-curing agent, and (c) a filler having average particle diameter of not larger than 3 μm.

2. The sealant for liquid crystals according to claim 1, wherein the polyvalent aromatic group is a di- or trivalent phenol or naphthol residue; a di- to tetravalent aromatic group formed by bonding 2 to 4 benzene rings or naphthalene rings (the benzene ring or naphthalene ring may have an aliphatic group of 1 to 6 carbon atoms as a substituent, and the total bonding arms on the ring is 2 to 4) through a single bond, a divalent aliphatic hydrocarbon residue (which may be substituted with a phenyl group) of 1 to 3 carbon atoms, an oxygen atom or a sulfur atom (which may be in a form of a sulfonyl); or a residue obtained by removing a hydroxyl group from a novolac resin.

3. The sealant for liquid crystals according to claim 2, wherein the polyvalent aromatic group is a divalent aromatic group

represented by the formula:

-ph-X-ph-

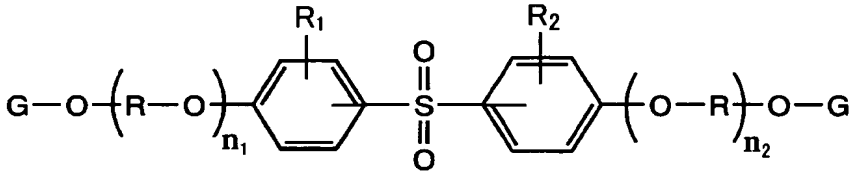
{wherein, ph represents a phenylene group (which may have an aliphatic group of 1 to 6 carbon atoms as a substituent); X represents a cross-linking group represented by -O-, -S-, $-S(O)_2-$ or the formula:

$-C(R_3)(R_4)-$

(wherein R_3 and R_4 represent each independently a hydrogen atom or a methyl group, or R_3 and R_4 are bondned to form a fluorene ring of $C(R_3)(R_4)$)}.

4. The sealant for liquid crystals according to claim 1, wherein the epoxy resin (a) represented by general formula (1) is a bisphenol S-type; and n represents 0 to 3 (average value).

5. The sealant for liquid crystals according to claim 4, wherein the epoxy resin (a) is an epoxy resin represented by general formula (2):

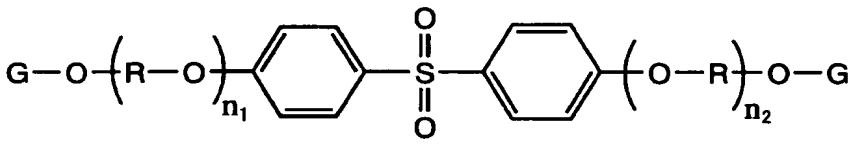


(2)

(wherein n_1 and n_2 represent each independently 0.5 to 3; R represents a divalent hydrocarbon group of 2 to 6 carbon atoms; R_1 and R_2 represent each independently a hydrogen atom or a monovalent hydrocarbon group of 1 to 6 carbon atoms; and G represents a glycidyl group).

6. The sealant for liquid crystals according to claim 5,

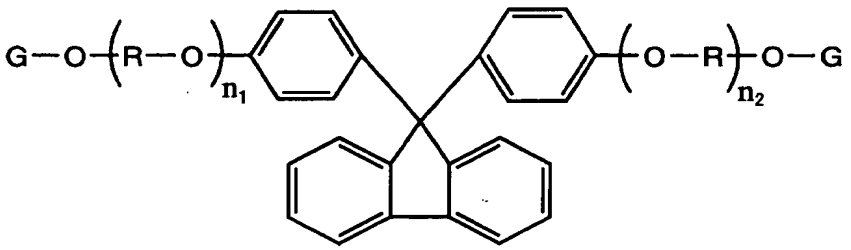
wherein the epoxy resin (a) is an epoxy resin represented by general formula (3):



(3)

(wherein n_1 and n_2 represent each independently 0.5 to 3; R represents a divalent hydrocarbon group of 2 to 6 carbon atoms; and G represents a glycidyl group).

7. The sealant for liquid crystals according to claim 1, wherein the epoxy resin (a) is an epoxy resin represented by general formula (4):



(4)

(wherein n_1 and n_2 represent each independently a positive number of 0.5 to 3; R represents a divalent hydrocarbon group of 2 to 6 carbon atoms; and G represents a glycidyl group).

8. The sealant for liquid crystals according to any one of claims 1 to 7, wherein -O-R- is $-O-CH_2CH_2-$.

9. The sealant for liquid crystals according to claims 1 and

4, wherein n represents 1 to 1.5.

10. The sealant for liquid crystals according to any one of claims 1 to 7, wherein the thermo-curing agent (b) is polyfunctional dihydrazides or a polyvalent phenol compound.

11. The sealant for liquid crystals according to claim 10, wherein the polyfunctional dihydrazides are isophthalic acid hydrazide, dihydrazides having valine hydantoin skeleton, or adipic acid dihydrazide.

12. The sealant for liquid crystals according to any one of claims 1 to 7, wherein mixing ratio of the epoxy resin (a) and the thermo-curing agent (b) is 0.8 to 3 equivalent of the active hydrogen of the thermo-curing agent (b)based on 1 equivalent of the epoxy group of the epoxy resin (a); and the content of the filler (c) having average particle diameter of not larger than 3 μm in the sealant for liquid crystals is from 5 to 40% by weight.

13. The sealant for liquid crystals according to any one of claims 1 to 7, further comprising, as a component, a curable resin (d) having a (meth)acrylic group and a radical-forming type photopolymerization initiator (e).

14. The sealant for liquid crystals according to claim 13, wherein the curing resin (d) having a (meth)acrylic group is a (meth)acrylate of an aromatic epoxy resin.

15. The sealant for liquid crystals according to claim 14, wherein the (meth)acrylate of an aromatic epoxy resin is a (meth)acrylate of a bisphenol-type epoxy resin.

16. The sealant for liquid crystals according to claim 13, wherein the curing resin (d) having a (meth)acrylic group is a (meth)acrylate of (a) an epoxy resin represented by the general formula (1) wherein n is not 0.

17. The sealant for liquid crystals according to claim 13, wherein the radical-forming photopolymerization initiator (e) is a carbazole-series photopolymerization initiator or an acridine-series photopolymerization initiator.

18. The sealant for liquid crystals according to any one of claims 1 to 7 and 13, further comprising a silane coupling agent (f).

19. The sealant for liquid crystals according to any one of claims 1 to 7, 13 and 18, further comprising an ion scavenger (g).

20. The sealant for liquid crystals according to claim 19, wherein the ion scavenger is at least one kind selected from a group consisting of a bismuth oxide-series ion scavenger, an antimony oxide-series ion scavenger, a titanium phosphate-series ion scavenger, a zirconium phosphate-series ion scavenger and a hydrotalcite-series ion scavenger.

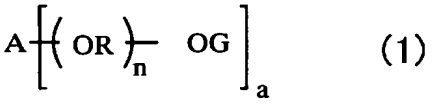
21. The sealant for liquid crystals according to claim 19, wherein the contents in the sealant for liquid crystals fall in the ranges of 5 to 80% of the epoxy resin (a) component, 2 to 20% of the thermo-curing agent (b) component, 5 to 50% of the filler (c) component having average particle diameter of not larger than 3 μm, 5 to 80% of the curable resin (d) component having a (meth)acrylic group, 0.1 to 3% of the radical-forming photopolymerization initiator (e) component, 0.2 to 2% of the silane coupling agent (f) component and 0.2 to 20% of the ion scavenger (g) component.

22. A liquid crystal display cell sealed by a cured product of the sealant for liquid crystals according to any one of claims 1 to 7, 13, 18 and 19.

23. A method for manufacturing a liquid crystal display cell

characterized, in the liquid crystal display cell composed of two substrates, by dropping a liquid crystal inside a bank of the sealant for liquid crystals according to any one of claims 1 to 7, 13, 18 and 19, that is formed on one substrate, thereafter bonding the other substrate thereto and then curing the sealant for liquid crystals.

24. A composition characterized by comprising (a) an epoxy resin represented by general formula (1):



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25. The composition according to claim 24, characterized by further comprising the curable resin (d) having a (meth)acryl group, the radical-forming photopolymerization initiator (e), the silane coupling agent (f) and the ion scavenger (g).